REMARKS/ARGUMENTS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-22 are pending.

In the outstanding Official Action, Claims 1-22 are rejected under 35 U.S.C. §103(a) as unpatentable over Applicant's Prior Art (Figure 7) in view of Yano (U.S. Patent No. 6,118,165). The outstanding rejection is respectfully traversed for the following reasons.

According to the device recited in Claim 1, light is incident on an area between each of a plurality of first semiconductor regions comprising a first conductivity type and a second semiconductor region comprising a second conductivity type without passing through these semiconductor regions. Therefore, it is possible to use the light incident on the semiconductor light-receiving device effectively without absorption of the incident light in the semiconductor regions. Further, the areas between the first and second semiconductor regions have a higher resistance than resistances of the first and second semiconductor regions, and are completely depleted in a state in which a reverse bias is applied between the first and second electrodes, so that the sensitivity characteristics of the device can be made superior.

In addition, the plurality of first semiconductor regions are formed apart from each other and the second electrode is formed on the second surface of the semiconductor substrate and not formed on the first semiconductor regions. Therefore, an area for contact with the second electrode is not necessary on each of the plurality of first semiconductor regions, so that it is possible to narrow a top surface area of the plurality of first semiconductor regions. This results in the widening of an area between each of the plurality of first semiconductor regions and the second semiconductor region, which is a light-receiving surface.

Accordingly, the amount of light incident on the light-receiving surface of the semiconductor light-receiving device is increased.

Accordingly, Claim 1 recites a semiconductor light-receiving device comprising:

> a semiconductor substrate having a first surface on a light-receiving side and a second surface on the opposite side to said first surface, said semiconductor substrate comprising a first conductivity type;
>
> a semiconductor layer formed on said first surface of said semiconductor substrate;
>
> a plurality of first semiconductor regions formed in said first semiconductor layer so as to reach said semiconductor substrate from a surface of said first semiconductor layer, said plurality of first semiconductor regions being formed apart from each other, and comprising the first conductivity type;
>
> a second semiconductor region selectively formed in a surface region of said semiconductor layer, said second semiconductor region surrounding each of said plurality of first semiconductor regions with a surface portion of said semiconductor layer therebetween and comprising a second conductivity type;
>
> a first electrode formed on said second semiconductor region; and
>
> a second electrode formed on said second surface of said semiconductor substrate;
>
> said surface portion of said semiconductor layer between each of said plurality of first semiconductor regions and said second semiconductor region having a higher resistance than resistances of said plurality of first semiconductor regions and said second semiconductor region.

The outstanding Office Action states that the Applicant's Prior Art (Figure 7) discloses the elements recited in Claim 1 except for the second electrode, and further that Yano discloses a light-receiving device containing a photodiode having a second electrode formed on a second side of a substrate.

However, in the device shown in Figure 7, P-type separating diffusion region 75 is disposed such that the region 75 electrically separates an N-type epitaxial layer 74 into plural light detecting regions. Each of the plural light detecting regions corresponds to a photodiode. The region 75 surrounds each of the plural different light detecting regions.

Each of plural N-type diffusion regions 76 is formed apart from each other and disposed in each of the light detecting regions. Thus, the arrangement of the P-type separating diffusion region 75 and the plural N-type diffusion regions 76 on a P-type substrate 81 is reverse to the arrangement of a "semiconductor substrate comprising a first conductivity type," "a plurality of first semiconductor regions ... comprising the first conductivity type," and "a second semiconductor region ... comprising a second conductivity type" recited in Claim 1. Further, it is respectfully submitted that Applicant's Prior Art does not suggest these elements either.

In addition, in the light-receiving device shown in Figure 7, the P-type separating diffusion region 75 and the plural N-type diffusion regions 76 are disposed close to each other with a very small interval therebetween. Light is incident on a region of the N-type epitaxial layer 74 between each of the plural N-type diffusion regions 76 and a P-type semiconductor substrate 81 through each of the plural N-type diffusion regions 76. The incident light is absorbed in each of the plural N-type diffusion regions 76, so that a sufficient sensitivity cannot be obtained.

Further, an electrode for taking out a substrate potential 83 is provided on the P-type separating diffusion region 75 and not on the other side of the P-type semiconductor substrate 81. Therefore, an area for contact to the electrode 83 is necessary on the P-type separating diffusion region 75, so that it is impossible to narrow a top surface area of the P-type separating diffusion region 75. This results in narrowing an area of the N-type epitaxial layer 74 between the P-type separating diffusion region 75 and each of the plural N-type diffusion regions 76, decreasing the amount light incident on the light-receiving surface of the semiconductor light-receiving device.

It is further respectfully submitted that Yano does not teach or suggest the above-mentioned features of Claim 1 and cannot obtain the advantages of the device recited in Claim 1.

Thus, it is respectfully submitted that the cited art does not teach or suggest each and every element of Claim 1. Accordingly, it is respectfully submitted that Claim 1 is patentable over the cited art.

Claims 2-6 are dependent, directly or indirectly, from Claim 1. Thus, it is respectfully submitted that Claims 2-6 are also patentable over the cited art.

Independent Claims 7, 12, and 18 recite similar elements to Claim 1. It is respectfully submitted that Claims 7, 12, and 18 are also patentable over the cited art for the reasons discussed above with respect to Claim 1.

Claims 8-11 are dependent from Claim 7. Thus, it is respectfully submitted that Claims 8-11 are also patentable over the cited art.

Claims 13-17 are dependent, directly or indirectly, from Claim 12. Thus, it is respectfully submitted that Claims 13-17 are also patentable over the cited art.

Claims 19-22 are dependent from Claim 18. Thus, it is respectfully submitted that Claims 19-22 are also patentable over the cited art.

Accordingly, the outstanding rejection is traversed and the pending claims are believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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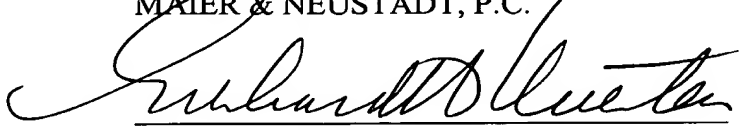

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